

REMARKS

Claims 1-28 are pending in the application.
Claims 1-28 were rejected.

(1) Claims 1-28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Saito et al. (U.S. Patent No. 6,024,900) in view of Adams et al. (U.S. Patent No. 6,200,915) to Ottinger et al. (U.S. Patent Application Publication No. 2002/0114952) to Blain et al., (U.S. Patent No. 6,413,601) and Cha et al. (U.S. Patent No. 5,164,054) Greinke et al. (U.S. Patent No. 6,555,271), Bonville (U.S. Patent No. 6,248,462), and von Bonin et al. (U.S. Patent No. 5,288,429).

Saito et al. teaches that production of expanded graphite from the raw material can be conducted by a known process. "For example, concentrated sulfuric acid is mixed with hydrogen peroxide to form peroxomonosulfuric acid; thereto is added raw material graphite with stirring to give rise to a reaction for about 1 hour to 1 day; and the reacted graphite is heated at 500-1,000 °C in an inert gas." (Saito et al.: col. 2,

lines 59-65). According to Saito et al., "expanded graphite obtained by adding 15% ammonium hydrogenperoxodisulfate to a mixture of 320 parts by weight of 95 wt. % concentrated sulfuric acid and 4 parts by weight of 62% hydrogen peroxide, mixing them with cooling to 20 °C or lower, adding natural graphite to the mixture to give rise to a reaction for 24 hours, and firing the reaction product up to 1,000 °C in nitrogen gas." Thus, Saito et al. describes using a conventional heating process to expand the graphite. Saito et al. does not show or suggest that a microwave process should be used to produce expanded graphite having superior properties as compared to graphite expanded by a heat treatment.

Blain et al. teaches that graphite flakes can be exfoliated by exposing them to an energy source, including microwave or radio frequency radiation. However, Blain et al. does not discriminate between microwave radiation and other sources of energy, such as heat sources including a flame or energy provided by infrared radiation. Von Bonin et al. teaches that microwaves are one method of heating the expandable

graphite, but does not teach advantages of a microwave treatment over conventional heating.

According to MPEP 2113, the structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where the product can only be defined by the process steps by which the product is made, or where the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979) (holding "interbonded by interfusion" to limit structure of the claimed composite and noting that terms such as "welded," "intermixed," "ground in place," "press fitted," and "etched" are capable of construction as structural limitations). The graphite platelets in the claims of the present application have been described by a product-by-process limitation. The precursor graphite has been expanded by heating in a microwave or radiofrequency wave applicator and then pulverized to produce the graphite platelets. Therefore, the structure implied by the process steps should be considered when assessing the patentability of

the claims over the prior art.

In the rejection it is stated that "It is not seen that adding energy via microwave or radio frequency emr produces different platelets than those of the prior art." However, the enclosed Declaration under 37 C.F.R. § 1.132 illustrates that graphite expanded by a microwave process has superior properties as compared to graphite expanded by a heat treatment. The graphite expanded by a microwave process has a higher degree of expansion and has a cleaner surface than graphite expanded by a heat treatment. As can be seen in Table 2.1 and Figure 2.11 on page 88 of the dissertation of Hiroyuki Fukushima, entitled "Exfoliated Process for Graphite Intercalation Compounds", microwave exfoliated graphite has approximately a ten fold higher surface area and aspect ratio than heat exfoliated graphite. In addition, since intercalate acid residue remaining on the graphite surfaces after treatment could cause problems, the cleanness of the graphite surface is important. Section 2.3.3.2 on page 89 of the dissertation of Hiroyuki Fukushima shows that the microwave treatments have an advantage over the conventional heating process in terms


of removal of the residual intercalates. Thus, graphite expanded by a microwave process has superior properties as compared to graphite expanded by conventional heating processes.

These results are unexpected considering the teachings of the cited references. None of the cited references teach of the advantages of graphite expanded by a microwave process. Saito et al., Adams et al., Ottinger et al., Blain et al., Cha et al., Greinke et al., Bonville , and Von Bonin et al., either taken alone or in combination, do not show or suggest the claimed invention. Reconsideration of the rejection is requested.

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In light of the above, it is now believed that Claims 1-28 are patentable and in condition suitable for allowance. Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully,



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Enclosure: Declaration under 37 C.F.R. §1.132.